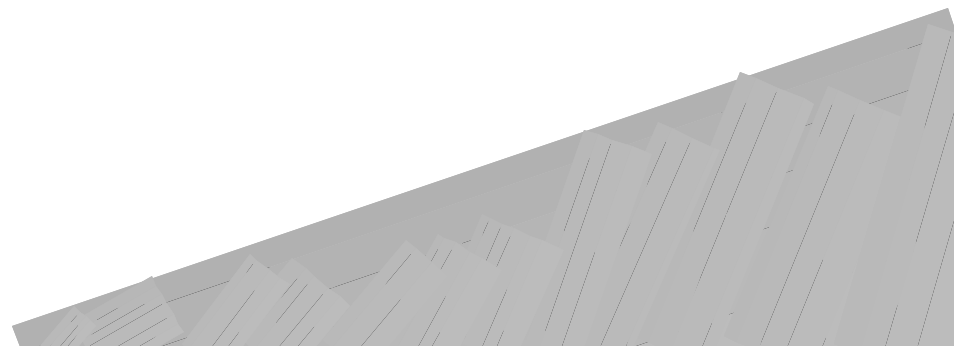


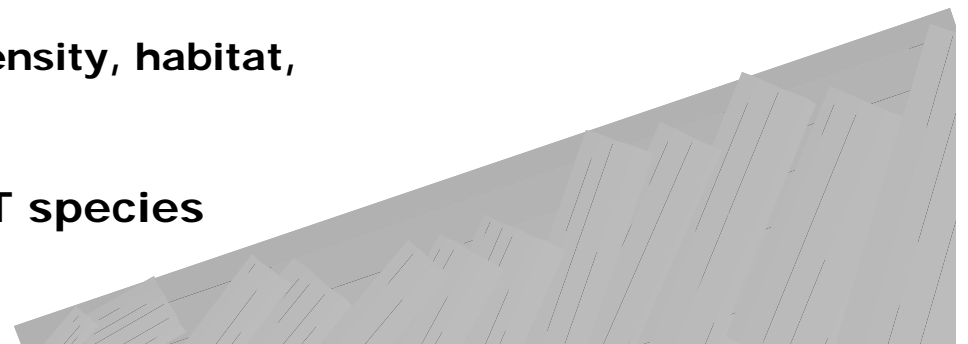
Biological Resources

- ◆ Vegetation (terrestrial)
- ◆ Wildlife (terrestrial)
- ◆ Aquatic Systems
- ◆ Wetlands
- ◆ Threatened & Endangered Species



Assessing Impacts to Terrestrial Vegetation

- ◆ **Identify Source of Potential Impacts**
 - Clearing and Grubbing
 - Change Hydrology (dewater/flood)
 - Toxic Substances
 - Spills
 - Placement of Fill
 - Mining
 - Shading
 - Non-indigenous Species
- ◆ **Determine Study Area**
 - Generally areas of direct impact
- ◆ **Determine Existing Conditions**
 - Aerial Photographs
 - Field Visit
 - Vegetation Classification
 - structure, dominant species, density, habitat, special species
- ◆ **Identify Standard**
 - Usually none except for E & T species



Vegetation (cont.)

◆ **Impact Prediction**

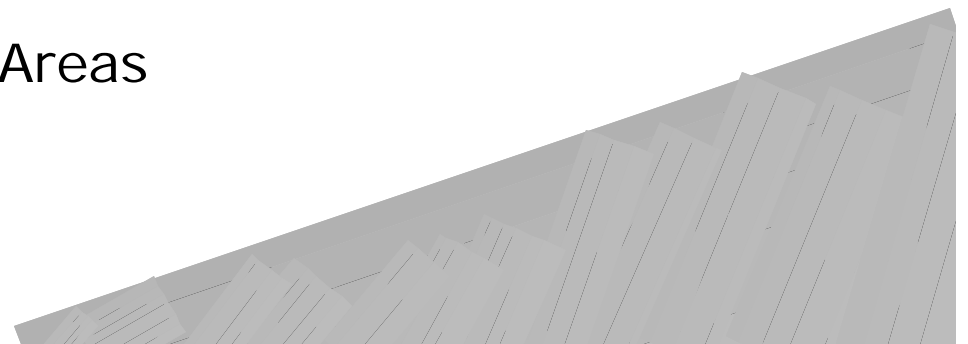
- Direct Taking
- Change in Hydrology
- Shading
- Toxins
- Invasion of Non-indigenous Species

◆ **Assess Significance of Impacts**

- Affect on Wildlife Species
- Percentage/Professional Judgment
- Unique Characteristics/ Sensitive Species
- Economic Value

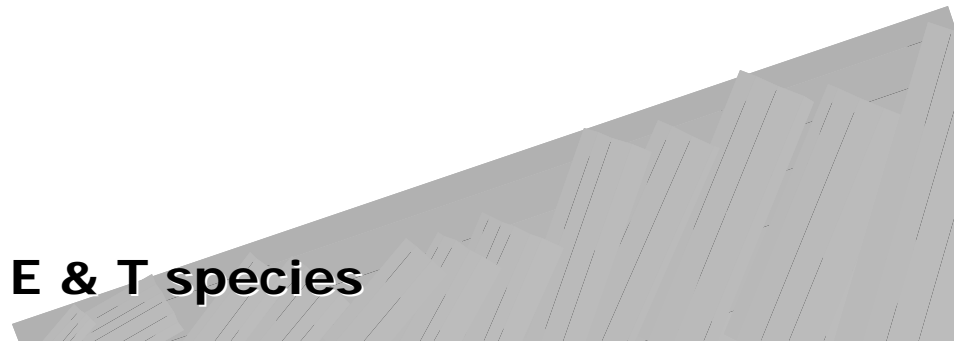
◆ **Mitigation**

- Avoid/Minimize Sensitive Areas
- Re-Vegetate
- Control Invasive Species



Assessing Impacts to Wildlife/Habitat

- ◆ **Identify Source of Potential Impacts**
 - Clearing and Grubbing
 - Change Hydrology (de-water/flood)
 - Toxic Substances
 - Spills
 - Placement of Fill
 - Shading
 - Noise
 - Human Contact
 - Non-Indigenous Species
- ◆ **Determine Study Area**
 - Generally areas of direct impact
- ◆ **Determine Existing Conditions**
 - Species Likely to Occur
 - Habitat - HEP Modeling
 - Field Visit
- ◆ **Identify Standard**
 - Usually none except for E & T species



Wildlife/Habitat (cont.)

◆ Impact Prediction

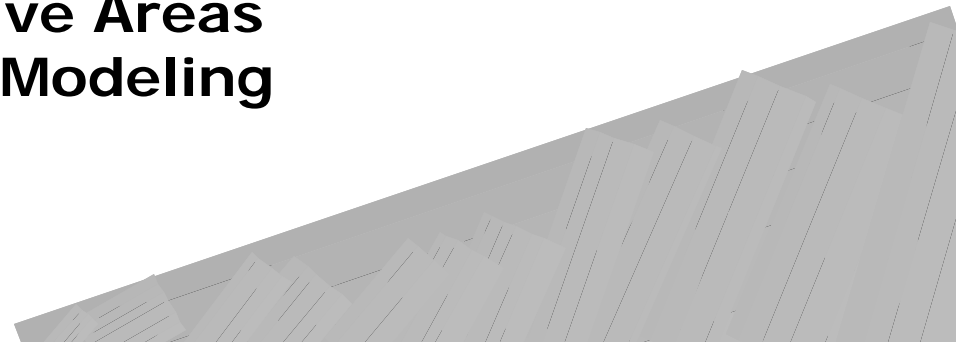
- Direct Taking
- Change in Habitat - HEP Modeling
- Shading
- Toxins

◆ Assess Significance of Impacts

- Affect on Wildlife Species of Concern
- Percentage/Professional Judgment
- Unique Characteristics/ Sensitive Species
- Economic Value

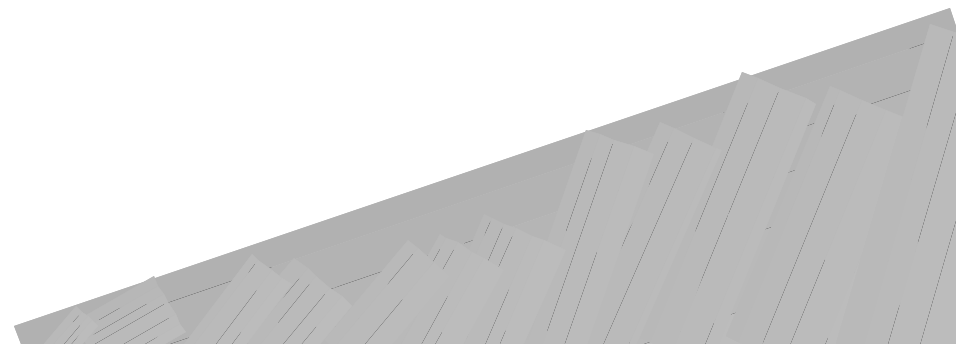
◆ Mitigation

- Avoid/Minimize Sensitive Areas
- Enhance Habitat - HEP Modeling



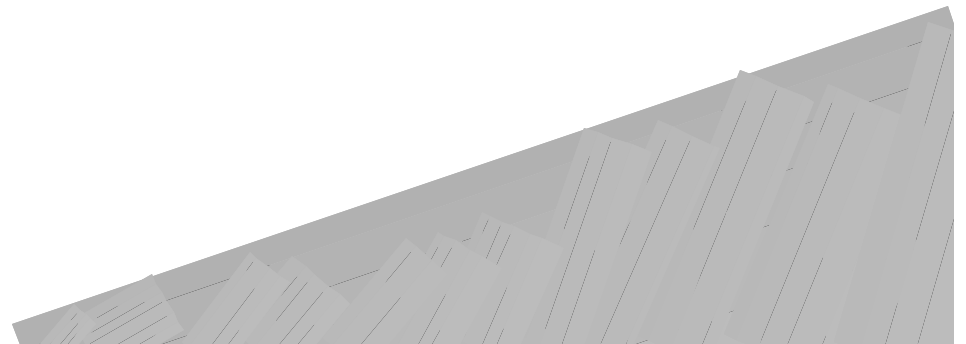
Habitat Evaluation Procedure (HEP)

- ◆ **US Fish and Wildlife Service**
- ◆ **Objectives**
 - Quantitatively Assess Existing Habitat Condition
 - Predict Impacts
 - Compare Alternatives
 - Consensus Effort
- ◆ **Value of Habitat**
 - **Habitat Suitability Indices (HSI)**- relate to carry capacity
 - **Evaluation Species**
 - ◆ 4 - 6 Species
 - ◆ Representative of Guild/Niche With Models
 - **Suitability Indices (0 - 1)**
 - ◆ Cover Requirements
 - ◆ Minimum Habitat Area
 - ◆ Food
 - ◆ Water
 - **Data Collection**
 - **Calculation of HSI**

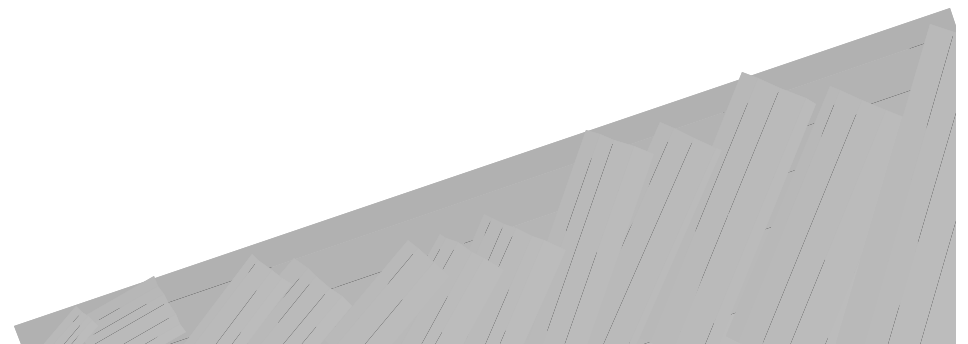
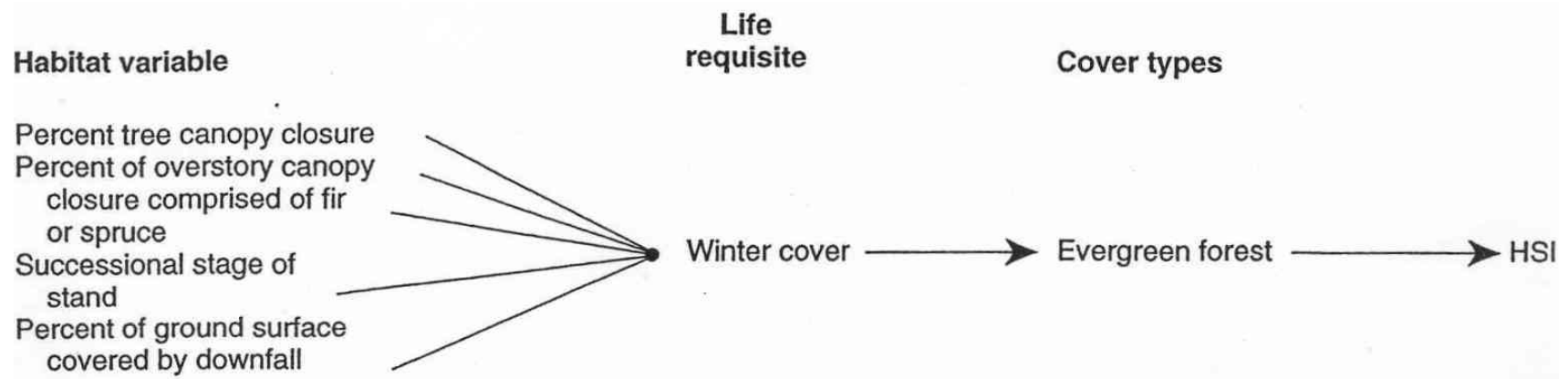


HEP (cont.)

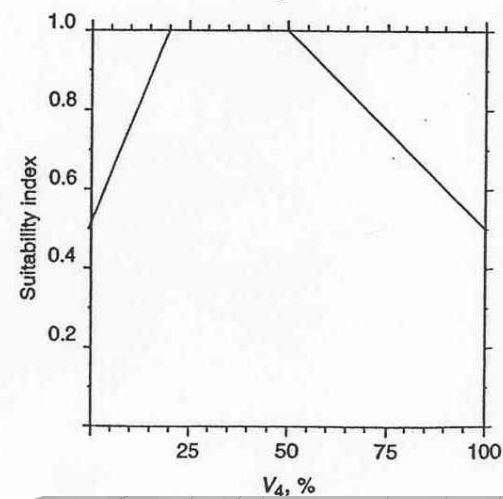
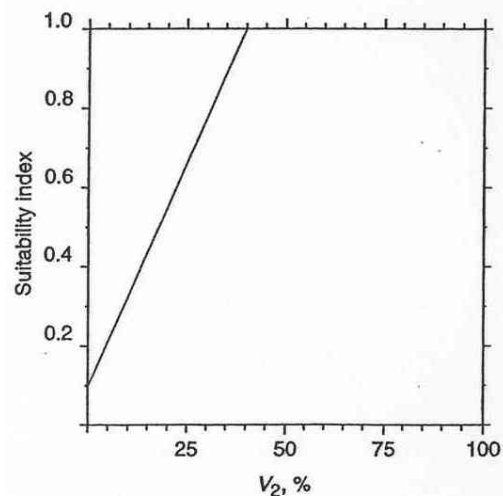
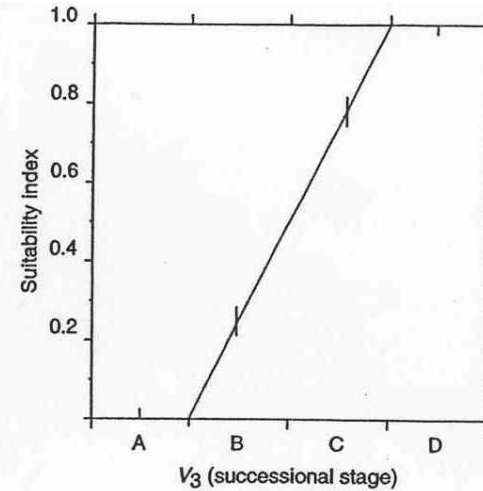
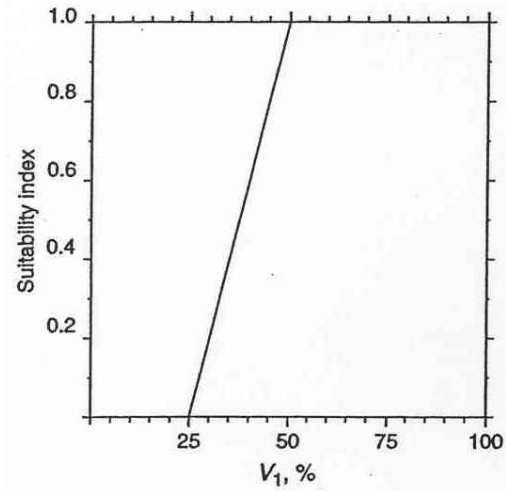
- ◆ **Value of Study Area**
 - Habitat Units = HSI * Area
- ◆ **Years of Analyses**
 - Baseline
 - Intermediate
 - Life of Project
- ◆ **Impact Assessment**
 - Average Annual Habitat Units (with and without project)
- ◆ **Mitigation**



HEP Model



HEP Suitability Indices



Calculating Habitat Value Loss

